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Animal feed or feed supplement

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The subject matter of the invention is animal feeds or feed supplements, particularly for sheep, swine, fowl, dogs, cats and other livestock, containing approximately 0.1 to 25 percent by weight of fermentation residue obtained in the production of glutamic acid by fermentation, said fermentation residue comprising solids filtered out of the fermentation medium and the mother liquor of the glutamic acid which has been crystallized and separated out.

In the production of animal feed additives, many efforts have been taken to obtain an improvement of flavor of the feed; however, the additives suitable for this purpose are usually expensive and for their part do not contribute to a well-rounded variety of nutrients in the feed. Thus, for instance, hydrolyzates of materials containing glutamic acid have been used as feed supplements; however, the stimulus for feed consumption compared to the animal feeds according to the invention was relatively low. In addition, such hydrolyzates containing glutamic acid known as feed additives are hygroscopic so that it is very difficult to process them into dry feeds and they must then be stored in watertight sealed packages. In addition, the pH of these hydrolyzates is between approximately 2.5 and 4.0 after removal of the glutamic acid which is the reason why such feed supplements must be neutralized with sodium carbonate, for instance, before being used as a feed to prevent excessive acidification of the feed.

The use of molasses vinasses of all types including the runoff from glutamic acid production to obtain active ingredients such as vitamin B_{12} or antibiotics or feed supplements containing these substances is further known. However, such feed supplements can only be obtained by further processing of residues from the production of glutamic acid by the action of schizomycetes, actinomyces and hyphomycetes, whereby the residues containing glutamic acid must simply be considered to be intermediate products. Finally, the use of fermentation residues obtained in the production of gibberellic acid with the aid of the microorganism *Gibberella fujikuroi* as well as the use of the vitamin-containing fermentation medium obtained in the culture of *Streptomyces aureofaciens* as animal feeds are also known. However, these also do not serve to improve the flavor and simultaneously increase the nutritional value as do the animal feeds according to invention as a result of which the animals receive a greater stimulus for feed intake and become ready for slaughter in a shorter time.

Glutamic acid obtained by fermentation is ordinarily separated from its fermentation medium by filtration of the fermentation medium, condensation of the filtrate and its adjustment to a pH of approximately 3.2 with crystallization of the glutamic acid. The filtered residue comprised of the other solids from the fermentation and the mother liquor of the crystallized glutamic acid are here designated together as fermentation residues. This fermentation residue can be dried by any customary means and used in dry form as well as in liquid form, preferably in dry form, however. A typical dry fermentation

residue obtained from the production of glutamic acid contains approximately 15% glutamic acid, 8% ash, 20% protein, 40% carbohydrate, 10% nitrogen-free organic substance and 10% moisture. This material is eagerly consumed by the animals since in addition to its contribution to nutrition, it improves the flavor and physical condition of the finished feed mix. In feeding sheep and other livestock, it was determined that the feed value of the glutamic acid fermentation residue is essentially equal to that of the soluble component of vinasse.

The quantity of dry fermentation residue added to a feed is based on the type of the feed used and is determined according to the purpose for which it is used. For instance, it is possible to use ... as a source of protein for fowl.

[Translator's note: Approximately four lines can not be translated due to the top left corner of a page being torn off.]

Approximately 10 to 25 parts by weight, preferably approximately between 10 to 15 parts of dry fermentation residue to 100 parts by weight of feed are used for sheep and other livestock. If desired, equivalent amounts of liquid or semi-liquid fermentation residues can be used in place of the dry form. In this case, approximately 0.25 to 5 percent by weight is already sufficient to substantially improve the flavor of the feed. The dried fermentation residue can be added to any type of animal feed such as alfalfa, maize, hay, cereal grain, silage fodder, beet pulp, protein meal and the like. It can be included in liquid rations or in solid components or in mixtures of liquid and solid components.

The fermentation residue can be included in feed mixtures and raw feed bases according to any customary method used for the incorporation of feed supplements into such mixtures, and it can also be made a part of a premix.

In one particular embodiment of the invention, a mixture of dry fermentation residue and dried beet pulp is used as approximately one-third of the ration for fattening young steers. The quantity of dried fermentation residue added to the pulp is sufficient to supply approximately 20% of the total solids of the mixture. The weight gain in young animals receiving the fermentation residue with beet pulp in a

ration is practically the same as the weight gain of steers fed with similar quantities of molasses in beet pulp preparations. The high concentration of nitrogen-containing material in the fermentation residue is desirable for the use of beet pulps, since the latter contain very little protein themselves.

Any fermentation of glutamic acid can be used to supply the fermentation residue according to the invention. An excellent fermentation residue is obtained with fermentation using the organism *Brevibacterium divaricatum*. A particular example for obtaining a fermentation residue is described below. This and the other examples serve to further illustrate the invention.

Example 1

In order to produce the fermentation residue according to the invention, a strain of *Brevibacterium divaricatum* producing glutamic acid was cultured for 20 hours at 30° in a culture medium of the following composition:

Glucose	3%
Urea	0.5%
K_2HPO_4	0.1%
$MgSO_4 \cdot 7H_2O$	0.5%
Broth extract	0.2%
Wheat bran extract (5%)	2%
Water to make up to volume	

The culture was then used to inoculate a nutrient medium of the following composition:

Glucose	10%
Urea	1%
K_2HPO_4	0.1%
$MgSO_4 \cdot 7H_2O$	0.05%
Wheat bran extract (5%)	4%
Water to make up to volume	
pH adjusted to	7.3

The above nutrient medium was incubated at 30°C and 0.5% urea and 1% ammonium tartrate were added after 18, 26, 32, 40 and 48 hours after inoculation. At the end of this time, the fermentation was stopped and the entire fermentation filtered. The solids were separated off and stored. The filtrate was condensed and the pH was adjusted to approximately 3.2, whereby glutamic acid crystallized out. The crystals were removed and the mother liquor was then added to the filtered, solid residue. The fermentation residue was obtained in this manner. Portions of this fermentation residue were dried in a rotary drier and the dried fermentation residue was obtained in this manner.

Example 2

The following basic rations were prepared for swine:

Components	Amount
Ground yellow maize	85.51 kg
Cane sugar	34.02 kg
Soy bean meal (50%)	54.54 kg
Water from fish pressing	5.67 kg
Dried whey	34.02 kg
Lard	5.67 kg
Lime	1.59 kg
Dicalcium phosphate	2.15 kg
Iodized salt	1.14 kg
Vitamin A supplement (10 000 IU/g)	125 g
Vitamin D supplement (4 M IU/0.45 kg)	30 g
Riboflavin supplement (3.63 mg riboflavin/0.45 kg)	160 g
Calcium pantothenate supplement (32)	30 g
Niacin (50%)	20 g
Choline chloride (25%)	115 g
Vitamin B_{12} supplement (6 mg B_{12}/0.45 kg)	750 g
Bacitracin supplement (zinc bacitracin 10 g/0.45 kg)	1.135 g
Oxidation inhibitor	28.5 g
Trace element and mineral salt mixture	115 g
Zinc oxide	28.5 g

The test variant contained the basic ration for swine plus approximately 2.25 kg dried fermentation residue.

The test was conducted placing two feed dispensers at the same distance from the water dispenser in each hog pen. The locations of the feed dispensers in each pen were identified as Position 1 and 2. A specific feed dispenser always contained the same ration; however, its composition in the pen was switched every three days. Each feed dispenser was placed on a sufficiently large board to collect waste

feed and the waste feed was weighed back and eliminated each time the position of the feed dispenser was changed. Every six days, the feed dispensers were removed from each pen, carefully cleaned and replaced by clean feed dispensers. At the end of a test lasting 24 days, it was evident that the hogs clearly preferred the feed ration with the fermentation residue compared to the basic feed ration. It was found that 61.2% by weight of the feed containing the fermentation residue was consumed by the hogs compared to only 38.8% by weight of the basic feed ration consumed by the control hogs. The hogs fed the fermentation residue in accordance with the invention thus consumed considerably larger amounts of feed; their weight gain was also significantly higher and the growth of the animals as well as their readiness for slaughter were accelerated

Feed for cattle and fowl obtained in a similar manner as in Example 2 led to similar results.

Claims:

1. Animal feed or feed supplement for sheep, swine, fowl, dogs, cats and other livestock in particular, characterized by a content of approximately 0.1 to 25 percent by weight of fermentation residues obtained in the production of glutamic acid by fermentation, said fermentation residues comprising solids filtered out of the fermentation medium and the mother liquor of the glutamic acid which has been crystallized and separated out.

2. Animal feed in accordance with Claim 1, characterized by the fact that it contains the fermentation residue in dry form.

Printed publications taken into consideration:
German Published Examined Application No. 1046834,
French Patent Specification No. 1208489,
US Patent Specification Nos. 2619420, 2758027, 3913340